

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-17 are pending in this application. Claims 1 and 16 are independent.

Claim Rejections under 35 U.S.C. § 103

Claims 1-4, 8, 10-13, 16 and 17

Claims 1, 2-4, 7, 8, 10-13, 16 and 17 stand rejected under 35 U.S.C. §103(a) as unpatentable over Hu et al. (U.S. Patent No. 5,430,783, herein Hu) in view of Ning (U.S. Patent No. 6,477,221). Applicants respectfully traverse this rejection.

Claim 1 is reproduced below for the Examiner's convenience and various features of the claim are emphasized.

1. A method for generating images in computed tomography using 3D image reconstruction, the method comprising:
 scanning an examination object by moving a focus on a spiral focal track about the examination object using a conical beam emanating from the focus and using a detector for detecting the beam, the detector supplying output data corresponding to the detected radiation; and
 reconstructing image voxels from the scanned examination object from the output data and reproducing attenuation coefficients of the respective voxel, *each image voxel being reconstructed separately* from projection data that include a projection angular range of at least 180°, *whereby a measured value filtered for each image voxel is accumulated only on the respective voxel, and an approximate weighting taking place for each voxel considered in order to normalize the projection data used relating to the respective voxel.*

Applicants respectfully submit that at least the above-emphasized features of independent claim 1 and the somewhat similar features of independent claim 16 patentably distinguish over the cited references as detailed below.

Hu is directed towards a reconstruction method for helical scanning computed tomography apparatus with a multi-row detector array employing overlapping beams. Hu describes that an overlapping of measuring data occurs with a spiral scan, thereby causing different voxels to be scanned multiple times. This additional scanning data are used for the reconstruction. To avoid an over-evaluation of the multiple-scanned voxels, it is necessary to introduce a corresponding weighting. However, a *voxel-specific* weighting is not described in Hu.

In fact, paragraph 5, line 68 to paragraph 6, line 1 of Hu states “*the present invention utilizes data from this extra scanning by weighting it and using it during the backprojection process on a voxel by voxel basis.*” Accordingly, Hu only describes that the additionally scanned data are weighted (*The present invention utilizes data from this extra scanning by weighting it*) and that a backprojection process is to be realized on a “voxel by voxel basis” (*and using it during the backprojection process on a voxel by voxel basis*). A voxel-specific reconstruction is not described anywhere in Hu.

The Examiner appears to share this opinion because otherwise there would be no need to also cite Ning. As such, Applicants assert that Hu merely addresses a reconstruction during which only separate voxels are reconstructed in a process, meaning a reconstruction on a “voxel by voxel” basis. In other words, Hu discloses a reconstruction that results in individual or separate voxels, but this reconstruction occurs on *the whole*. Hu utilizes a closed reconstruction, which results in the absorption of values for a plurality of individual voxels.

Conversely, claim 1 recites “*each image voxel being reconstructed separately from projection data.*” Accordingly, a plurality of closed reconstruction processes are therefore carried out for the reconstruction of volume data composed of a plurality of voxels. Stated differently, according to claim 1, exclusively and precisely those beams, which penetrate a single

voxel, are taken into consideration *for each individual reconstruction process of the single voxel*. Claim 1 also recites that “*a measured value filtered for each image voxel is accumulated only on the respective voxel*.” This feature further clarifies that each voxel is reconstructed separately and individually in a separate reconstruction process. This does not mean that every voxel is individually present after the reconstruction, but it means that each reconstruction process exclusively relates to the individual voxel.

In light of the above, Applicants submit that Hu does not disclose or suggest either a separate weighting of the voxel-penetrating rays for each voxel, or a reconstruction where each voxel is respectively reconstructed in a separate reconstruction process.

To cure the deficiencies of Hu, the Examiner relies on Ning. In particular, the Examiner cites column 8, lines 8-10 of Ning. Applicants acknowledge that column 8, lines 8-10 states “*[I]n the reconstruction process, all voxels and projections are independent of one another, and rays can be backprojected independently.*” This statement allegedly provides the reference that a voxel-separate reconstruction of this type can be realized in combination with the method disclosed in Hu. However, the Examiner in this case overlooks the context for this statement of Ning, wherein one skilled in the relevant art would of course take into account this context and the total content disclosed in the patent.

The complete paragraph at column 8, lines 4-15 of Ning describes that the reconstruction processes can be run in parallel and on multi-processor systems because of their mathematical independence. Ning therefore states that it is possible to realize known reconstruction processes faster on a multi-processor system. With respect to this, Ning describes in column 8, lines 4 to 10 that various forms of parallelization are possible with the "Feldkamp" algorithm, namely a pixel-type, a projection-type, a type using rays and an operational type parallelization. Ning explains this by stating that, in the reconstruction process, all voxels and projections are

independent and that rays can be backprojected independently. Subsequently, Ning exclusively deals with the parallelization of fast Cone-Beam-Reconstructions, which do not point to the method recited in independent claim 1 and thus, Ning fails to cure the deficiencies of Hu with respect to claim 1.

Further, if one skilled in the art consequently were to combine Hu with the Ning reference, then he/she would follow the teaching of Ning as a whole and arrive at the conclusion that the reconstruction algorithms proposed by Hu could be realized faster with the aid of multi-processor units. As such, he/she would correspondingly parallelize the method described in Hu, may run it in less time on a multi-processor system, and may thus realize the process during a shorter time period. Accordingly, neither Hu nor Ning, provide a rationale indicating that the reconstruction process in Hu should be changed and a voxel-separate reconstruction should be used. Still further, even if one skilled in the art were to follow this path, which actually cannot be followed, the voxel-separate weighting is not disclosed in either Hu or Ning.

In light of the above, Applicants submit that even if the combination of Hu and Ning is proper, which Applicants do not admit, the combination of these references still fails to disclose, teach or suggest all of the features of independent claim 1 or the somewhat similar features of independent claim 16.

Therefore, Applicants request the rejection of claims 1 and 16, as well as claims 2-4, 7, 8, 10-13 and 17 depending therefrom, under 35 U.S.C. §103(a) be withdrawn.

Claims 5 and 14

Claims 5 and 14 stand rejected under U.S.C. §103(a) as unpatentable over Hu, Ning and Lai (U.S. Patent No. 6,118,841).

Applicants respectfully submit that Lai fails to cure the deficiencies of Hu and Ning as described above with respect to independent claim 1 and thus, respectfully submit that dependent claims 5 and 14 are allowable over Hu, Ning and Lai for at least the same reasons that independent claim 1 is allowable over Hu and Ning.

Therefore, Applicants respectfully request that the rejection of claims 5 and 14 under 35 U.S.C. §103(a) be withdrawn.

Claims 6 and 15:

Claims 6 and 15 stand rejected under 35 U.S.C. §103(a) over Hu, Ning, Lai and Silver et al. (U.S. Publication No. 2003/0123614, herein Silver).

Applicants respectfully submit that neither Lai nor Silver, either alone or in any proper combination, cure the deficiencies of Hu and Ning as described above with respect to independent claim 1 and thus, respectfully submit that dependent claims 6 and 15 are allowable over Hu, Ning, Lai and Silver for at least the same reasons that independent claim 1 is allowable over Hu and Ning.

Therefore, Applicants respectfully request that the rejection of claims 6 and 15 be withdrawn.

Claim 9:

Claim 9 stands rejected under 35 U.S.C. §103(a) over Hu, Ning, and Gullberg et al. (IEEE Vol. 11, no. 1, June 1992, herein Gullberg).

Applicants respectfully submit that Gullberg fails to cure the deficiencies of Hu and Ning as described above with respect to independent claim 1 and thus, respectfully submit that

dependent claim 9 is allowable over Hu and Ning for at least the same reasons that independent claim 1 is allowable over Hu and Ning.

Therefore, Applicants respectfully request that the rejection of claim 9 be withdrawn.

CONCLUSION

Accordingly, in view of the above amendments and remarks, reconsideration of the rejections and allowance of each of pending claims of the present application is earnestly solicited.

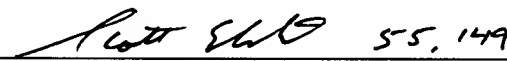
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Donald J. Daley at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKY, & PIERCE, P.L.C.

By


Donald J. Daley, Reg. No. 34,313

Scott A. Elchert, Reg. No. 55,149

P.O. Box 8910
Reston, Virginia 20195
(703) 668-8000

DJD/SAE/ame